

ASSESSING REGULATORY FOCUS DIFFERENCES IN CREATIVE IDEATION: AN EXAMINATION OF PREVENTION AND PROMOTION MINDSETS ON NOVELTY AND USEFULNESS

Meurzec, Rianne Wally (1); Koh, Brandon (2); Koronis, Georgios (1); Kang, Jacob Kai Siang (1);
Yogiawan, Christine (1); Silva, Arlindo (1)

1: Singapore University of Technology and Design; 2: Singapore Management University

ABSTRACT

The purpose of this work is to compare impact of regulatory focuses, namely preventive and promotional contexts, on creative ideation measured by novelty and usefulness. The study consisted of Singaporean students from an undergraduate university, and assessed their personality using the Big Five, Regulatory Focus, Creativity type and creativity outcomes measured with the Consensual Assessment Technique by completing a Collaborative Sketch exercise. Participants were randomly assigned to either the preventive, promotional or a baseline condition and tasked with a design problem necessitating a solution in the form of sketches. This study found the three conditions to yield significantly different novelty scores, but not usefulness scores. The most impactful condition on novelty was the baseline, indicating novice designers are capable of creating novel products and services. Those in the promotion condition created the second most novel sketches, or design solutions, followed lastly by the prevention condition. This may be so as novice designers consider larger space of solutions and may generate more ideas. This research is useful in creative pedagogy and for design professionals.

Keywords: Design cognition, Design education, Human behaviour in design

Contact:

Meurzec, Rianne Wally
Singapore University of Technology and Design
International Design Center
Singapore
riannemeurzec@hotmail.com

Cite this article: Meurzec, R.W., Koh, B., Koronis, G., Kang, J.K.S., Yogiawan, C., Silva, A. (2019) 'Assessing Regulatory Focus Differences in Creative Ideation: An Examination of Prevention and Promotion Mindsets on Novelty and Usefulness', in *Proceedings of the 22nd International Conference on Engineering Design (ICED19)*, Delft, The Netherlands, 5-8 August 2019. DOI:10.1017/dsi.2019.8

1 INTRODUCTION

The study of creativity is broad, existing and flourishing across disciplines such as in the social sciences, manifesting in psychology and sociology, as well as in sciences such as architecture, engineering and design. Amabile posited in 1983 that social and environmental factors accounted for a striking amount of influence on creativity in individuals. She asserted the need for creativity research in social psychology to address the interaction of social and environmental factors with personality characteristics and cognitive abilities on observable creativity. Since 1983, much research has gone into exploring this dearth (Amabile, 1996; Hennessey, 2003; Amabile and Pillemer, 2012), and progressed the understanding of creativity as a construct, as well as methods of stimulation or inhibition for creative outcomes. A creative project is often initiated with a design brief. Yet, there is an absence in literature identifying what constitutes an effective design brief, and how its framing could impact the designers' creative cognition and outputs in terms of novelty and usefulness. To address this gap, we experimentally manipulated the framing of design briefs according to a promotion or prevention focus, and also measured participants' personalities and their creative approaches. This research is important to improve communication between clients and designers, in attaining creative products or services and satisfying client expectations. This paper explores the existing literature on personality and stimulation of creativity, before describing the study, and identifying the implications. To the best of our knowledge, our research is the first to experimentally manipulate design brief framing, while simultaneously considering the interactions with personality and its downstream psychological and creative consequences.

2 BACKGROUND

2.1 Creativity

Amabile (1994) outlines the two questions needed to carefully capture creativity in essence. The first question is what differentiates ordinary performance from creative performance; while the second is what personal ability and characteristics, social environments or other conditions are most favourable to creative performance. These questions are useful in developing our understanding of creativity, but also in adopting a framework for which to test and measure creativity. Ma (2009) explores creativity as a personality trait, a product and a process. Harnessing from this view, we aimed to understand the personality profiles of our participants with scales such as the Big Five, Regulatory Focus Scale, and Incremental Radical Creativity. We hoped to manipulate their environment by providing design briefs from varying conditions, namely baseline, prevention and promotion. Finally, we hope to see the effect on creativity, measured by Amabile's Consensual Assessment Technique, with the metrics of novelty and usefulness. The research model for our study is illustrated in Figure 1, demonstrating the independent variables of personality constructs, as well as the three conditions, and the Consensual Assessment Technique as dependent variable.

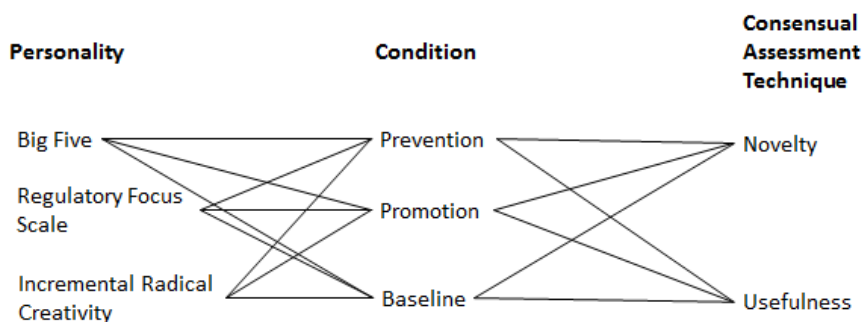


Figure 1. Research model

2.2 Big five

The Big Five personality assessment tool is one that has been widely used, in the fields of psychology, sociology and the social sciences. It has been used as a tool to ascertain job performance (Barrick and Mount, 1991), academic performance (Trapmann *et al.*, 2007; Poropat, 2009) and career choices

(Zhao and Seibert, 2006; Bono and Judge, 2004). The Big Five refers to five constructs, or facets of personality, that define people, namely openness to experience (intellectual, imaginative, independent-minded), conscientiousness (orderly, responsible, dependable), extraversion (talkative, assertive, energetic), agreeableness (good-natured, cooperative, trustful) and neuroticism (absence of calm, emotional instability) (John and Srivastava, 1999). The Big Five is a comprehensive framework (Goldberg, 1990) and is therefore, an intuitive starting point for personality research. One longitudinal study by Sung and Choi (2009) found that extraversion and openness to experience factors had a significant positive relationship on creative performance. Another study (Batey *et al.*, 2010) found that the Big Five was a significant predictor of ideational behaviour, an indicator of creativity, explaining up to 22% of variance. Leung and Chiu (2008, 2010) also demonstrated that individuals with higher openness to experience are more adept at learning from multicultural experiences to generate more novel ideas. As part of our study, we hypothesized (H1) students with high openness to experience and extraversion would score highly on creativity indices.

2.3 Regulatory focus questionnaire

The Regulatory Focus theory (Higgins, 1997) suggests that persons rely on two distinct mindsets when pursuing their goals, namely promotion and prevention focuses. The promotion focus mindset sees individuals being driven by their ideals and seeking gains while avoiding situations where no gain is earned. Contrastingly, prevention focused individuals are driven by their obligations or duties, and seek to avoid loss, or maintenance of status quo (Higgins, 1997). As such, the theory proposes that the framing of a task interacts with an individuals' mindset, thereby either intensifying or disrupting their motivation in task performance. Where mindset and task framing align, a condition known as "regulatory fit" emerges, illustrating that individuals feel right about their goals, thus increasing their motivation and performance (Cesario, Higgins, and Scholer, 2008; Higgins, 2000). When applied to creativity, studies have found preventive mindset to be inhibitive of creativity (Baas, De Dreu, and Nijstad, 2008; Bittner and Heidemeier, 2013; Friedman and Förster, 2001). As such, we hypothesized (H2a) students with promotion focused mindsets would do better in promotion-oriented tasks (i.e. with the exposure to promotion focused design briefs). Alternatively, we also hypothesized (H2b) students with prevention focused mindsets would do better in prevention-oriented tasks (i.e. with the exposure to prevention focused design briefs).

2.4 Incremental radical creativity

Another aspect of creativity research deemed useful in this space is the type of creativity that is stimulated. Gilson and Madjar (2011) determined two distinct types of creativity, namely radical creativity associated with exploring completely new ideas and producing game-changing innovations that do not resemble their point of origin, and incremental creativity associated with exploiting best available ideas to improve upon existing solutions. A study by Madjar *et al.* (2011) found that willingness to take risks, access to resources for creativity and career commitment are associated primarily with radical creativity, while the presence of creative co-workers and identification with the organization is associated with incremental creativity. As such, we hypothesized (H3) that promotion focused individuals would rank themselves as having higher radical creativity, while the prevention focused individuals would rank themselves as having higher incremental creativity.

2.5 Consensual assessment technique

According to Amabile (1996), creativity can be measured by novelty and appropriateness (usefulness, correctness, valuableness) when applied to a product or response. To do so, we employed the Consensual Assessment Technique (Amabile, 1996), a powerful tool that has been used across multiple studies for measuring creativity, under the metrics of novelty and usefulness. Our study employed the assessment technique detailed by Amabile, however, with a modified version of usefulness. Novelty was defined by the extent to which a design was different from usual forms of products and services on the domain under study. Usefulness was defined by a series of factors, namely Implementability, Effectiveness, Applicability, Ease of Use and Storage, and Affordability. The factors were selected following a literature review of the various definitions of usefulness (Dean *et al.*, 2006). Our interest to use a modified version of the usefulness metric was to include a broader definition of usefulness, as the briefs presented participants with several possible interpretations. As

such, we hoped to assess products and services rendered by participants with a broad enough metric of usefulness. The use of the Consensual Assessment Technique was helpful to provide a framework for expert and non-expert judges to assess C-Sketches, while maintaining a rigorous definition of creativity scores, namely novelty and usefulness. We hypothesized (H4) that significant differences would exist on creativity scores (measured with novelty and usefulness) between conditions (prevention, promotion and baseline groups).

3 METHODOLOGY

3.1 Design and participants

Participants were recruited from a local university specializing in technology and design, from a core first-year course called Introduction to Design. A total of 149 participants were recruited, aged from 17 to 24 years (mean age = 20 years old), and consisted of 65% male and 35% female. Participants were randomly assigned to the baseline, promotion focused, or prevention focused conditions. In the baseline brief condition, they were given basic information surrounding a design task requesting their development of a mobility device for persons in low income brackets. In the promotion focus and prevention focused conditions, the same information was reframed to induce designers to think in terms of pursuing a design ideal, or to satisfy the design task's obligation, respectively (see Appendix).

3.2 Measures

3.2.1 Big five

The Big Five instrument (Soto and John, 2017) was completed by participants during the admission process into the university. It captures the personality factors of openness to experience, conscientiousness, extraversion, agreeableness and neuroticism, on a 5-point Likert scale indicating agreement. The university classes are calibrated to include a mix of student profiles.

3.2.2 Regulatory focus questionnaire

The Regulatory Focus questionnaire (Lockwood, Jordan and Kunda, 2002) was administered online as part of the pre-survey. This scale captures participants promotion and prevention focus traits as independent factors. An example promotion item includes "I typically focus on the success I hope to achieve in the future", and a prevention item includes "I frequently think about how I can prevent failures in my life". The Regulatory Focus questionnaire uses a 5-point Likert scale to indicate agreement, and exhibited good internal reliability for both factors of prevention ($\alpha=0.79$), and promotion ($\alpha=0.84$).

3.2.3 Incremental radical creativity

The Incremental Radical Creativity (Gilson and Madjar, 2011) was administered online as part of the post-survey. The factors composing the Incremental Radical Creativity Scale showed acceptable alphas for the subscale of radical ($\alpha=0.82$) and incremental ($\alpha=0.74$) creativity.

3.2.4 Consensual assessment technique

The Consensual Assessment Technique (Amabile, 1996) is a tool we used in two ways. First, we used it to ask students to assess their peers' C-Sketches. Second, we used it as part of the expert judges' assessment of C-Sketches. The Consensual Assessment Technique amongst students showed good interrater consistency, as indicated by the one-way random intraclass correlation, ICC novelty = 0.78, ICC usefulness = 0.89. The five items of the Usefulness scale were subjected to an exploratory factor analysis using the Maximum likelihood method. The Kaiser-Meyer-Okin value was 0.74, exceeding the recommended value of 0.6 (Kaiser, 1970) which indicates sampling adequacy. A single factor solution was extracted explaining 61% of the variance respectively, with all factor loadings exceeding .68. This supports that the usefulness scale measures a unidimensional construct.

3.3 Procedures

Participants completed a workshop as part of their university requirements. Participants worked in teams of 4 on average. They first completed an online pre-task survey investigating their dominant

regulatory focus. Participants then received a design brief according to their experimental condition and were tasked to complete a C-Sketch (White, Wood & Jensen, 2012) in their groups within 25 minutes. During the C-Sketch, participants were to generate and sketch a novel idea that would contribute to part of the group design. Every 5 minutes, their partial designs were rotated to the next team member. Each member continued to make edits and improvements until the C-Sketches returned to their original owners. After the C-Sketch exercise, participants completed a peer evaluation assessment using the Consensual Assessment Technique. In this task, participants in the sample evaluated the C-Sketches produced by other groups for their novelty and usefulness and on average rated approximately 4 C-Sketch sheets. Once the peer evaluation was completed, participants completed an online post-task survey, investigating their reception of the design brief, their motivation, and personality measures. Participants Big Five personality scores were obtained from the University entry survey archives.

4 RESULTS

This study had a sample size of 149 for the prevention, promotion and baseline groups, which yielded a total of 441 sketches. A summary of descriptive statistics is detailed in Table 1 displaying the sample size, mean and standard deviation of included variables.

Table 1. Descriptive statistics

Category	N size	Mean	Standard deviation
Baseline	20		
Prevention	59		
Promotion	70		
BF Openness	132	2.05	0.94
BF Conscientiousness	132	2.04	0.97
BF Extraversion	132	1.72	0.90
BF Agreeableness	132	2.11	0.92
BF Neuroticism	132	2.14	0.91
RFQ Promotion	149	3.87	0.61
RFQ Prevention	149	3.48	0.69
Incremental Radical Creativity	149	3.91	0.49
Novelty	149	3.40	0.54
Usefulness	149	3.03	0.40

The “BF” prefix indicates Big Five scale; the “RFQ” prefix indicates Regulatory Focus Questionnaire

4.1 Big five

A detailed breakdown of student Big Five scores can be found in the Appendix.

4.2 Regulatory focus questionnaire

Our total sample exhibited a larger proportion of participants as having a promotional regulatory focus (64%) compared to a preventive regulatory focus (30%), and a small subset was tied between the two (6%). Of those in the prevention design brief sample (n=59), 34% ranked dominantly in prevention focus, 61% ranked dominantly in promotion focus, and the rest tied between the two. Of those in the promotion design brief sample (n=70), 29% ranked dominantly in prevention focus, 65% ranked dominantly in promotion focus, and the rest tied between the two.

4.3 Incremental radical creativity

Our total sample exhibited a larger proportion of participants as having incremental creativity (43%) compared to radical creativity (31%) and a large subset was tied between (26%). Of those in the prevention design brief sample (n=59), 49% ranked dominantly in incremental creativity, 24% ranked dominantly in radical creativity, and the rest tied between the two. Of those in the promotion design brief sample (n=70), 39% ranked dominantly in incremental creativity, 35% ranked dominantly in radical creativity, and the rest tied between the two.

4.4 Model testing

A one-way between-groups analysis of variance (ANOVA) was conducted to explore the relationship between personality metrics, regulatory focus, incremental radical creativity and creativity metrics (namely novelty and usefulness) by condition (specifically baseline, prevention and promotion groups). Only the novelty condition yielded significant differences. Subjects were divided into three groups according to the condition they were exposed to (Group 1: Baseline, Group 2: Prevention, Group 3: Promotion). There was a medium-sized main effect of experimental condition on Novelty scores, $F(2, 146) = 9.27, p < .001, \eta^2 = .11$. Post-hoc comparisons using the LSD test indicated that the mean score for the baseline condition ($M = 3.82, SD = 0.46$) was significantly higher on novelty score than the promotion focus condition ($M = 3.41, SD = 0.52$); in turn, the promotion focus condition exhibited significantly higher novelty scores than the prevention condition ($M = 3.25, SD = 0.53$). Figure 3 illustrates the means plot for Novelty across conditions.

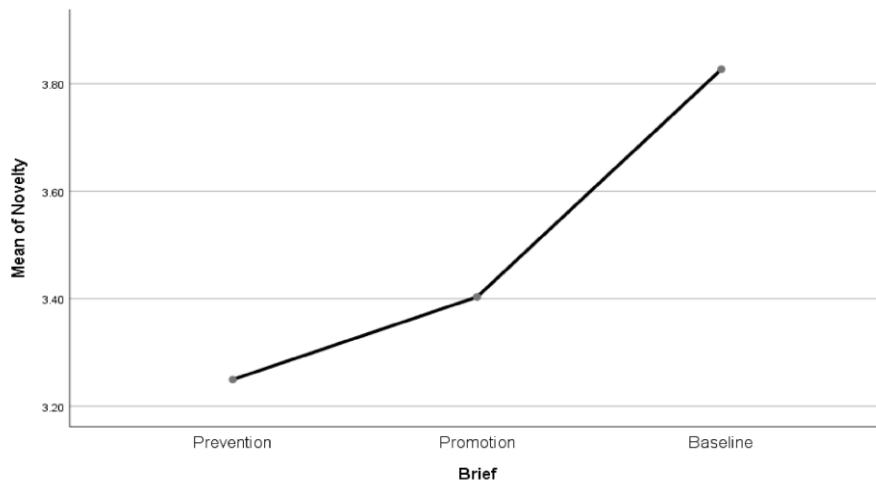


Figure 2. Means plot for Novelty across conditions

5 DISCUSSION

Our research project aimed to identify personality profiles, and whether the conditions of baseline, prevention and promotion framing would have an effect on creativity metrics, namely novelty and usefulness. It was found that within our sample, personality, regulatory focus and incremental radical creativity did not have an impact on the Consensual Assessment Technique creativity metrics. Usefulness was also psychometrically defined in a novel way, with the inclusion of implementability, efficacy, applicability, ease of storage and use, and affordability creating a score of usefulness. The measure of usefulness proved to be insignificantly different between the three conditions. Novelty, on the other hand, demonstrated a significant difference between the conditions, with the baseline condition yielding the highest novelty scored sketches, followed by the promotion condition and lastly, the prevention condition. In returning to our hypotheses, in H1, we expected but did not find openness to experience and extraversion to positively predict creativity scores. In H2a, we expected students with promotion focused mindsets on the regulatory focus questionnaire to do better at promotion-oriented tasks (those in the promotion condition), however, we found this not to be the case. In H2b, we expected the inverse of H2a for the prevention group, but similarly found this not to be true in our sample. Our third hypothesis posited that promotion focused individuals would have higher radical creativity, while prevention focused individuals would have higher incremental creativity. We found both groups to rank highest on incremental creativity, followed by radical creativity and lastly tied between both, thus disproving this hypothesis. Lastly, H4 hypothesized significant differences would exist between the design brief conditions and creativity indices. This hypothesis was proven correct, with novelty score demonstrating significant differences between the three conditions but was not held up for usefulness. Within the novelty score, the baseline condition scored highest, followed by promotion condition and lastly the prevention condition. It can be speculated that the reason for the baseline condition to yield the highest novelty score is because of the inherent vague nature of the baseline brief, allowing participants to interpret the design brief freely and

without the pre-set of any regulatory focus. Considering our sample was that of first-year undergraduate students, it is perhaps correct to expect students from this background to be less fixated than senior students and practitioners, and to allow their creativity to construct sketches with originality. One study (Yuan *et al.*, 2014) found that experts were found to be more practical, structured, detailed and had more control of actions during design, compared to their novice counterparts which were found to consider larger space of solutions and the ability to generate more ideas, though not realistic. The second most novel group, those within the promotion design brief condition, is unsurprisingly significant as students identified with a promotion regulatory focus at the highest proportion, followed by prevention and lastly, a tie between the two mindsets. As such, students were predisposed to be more promotion focused, and those in the promotion condition were more novel than their prevention counterparts.

6 CONCLUSION AND FUTURE WORK

The research conducted aimed to find relationships between personality (using the Big Five scale), Regulatory Focus, Incremental Radical Creativity and creativity scores (namely novelty and usefulness). The key finding of this research indicated that novelty yielded significantly different results between the three conditions, with the baseline condition yielding the highest novelty scores, followed by the promotion condition and lastly the prevention condition. The reason behind this may be that undergraduate students are less likely than professionals to be moulded and fixated mentally, thus allowing them to explore novel ideas more easily. Further, it is unsurprising that the promotion design brief condition yielded the second highest novelty scores, as the sample was mostly promotion focused, in regulatory focus. Limitations of this research include the small sample, and the fact that participants were undergraduate students, thus perhaps limiting the applicability of findings to a more senior professional population. This study would benefit from a second set of creativity scores, which would have been well served with the expert judges' ratings. This research may prove useful to the pedagogy of design and creativity to student designers, as well as design and architect professionals. Lastly, this research may be impactful for those seeking design work, to optimize communication of their needs and desires and maximize the creative outcomes of design. Future research in this field can replicate this study with the use of older participants, and professionals in larger numbers to provide comparative results.

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ACKNOWLEDGMENTS

This work is supported by the Singapore University of Technology and Design (SUTD) and the SUTD-MIT International Design Centre (IDC, idc.sutd.edu.sg), project IDG 11600102. The authors thank Nilanjan Raghunath and Pei Zhi Chia for their input, and the 2018 batch of first-year undergraduate student-designers for their ideation efforts and collaboration.

APPENDIX

Design Task Instructions

Design a device to improve mobility for low income persons with physical disabilities.

The device should:

- Help the user move independently across difficult, uneven, narrow, or inclined terrains
- Be affordable
- Be easy to maintain and repair
- Support movement of user onto and off the device (support daily living)
- Be easy to store or move device when not in use

You should aim to be as creative as possible. Please take the next five minutes to reflect on this brief.

Baseline brief

Design Task Instructions

Design a device to mitigate immobility and dependency amongst the elderly or people with physical disabilities. This device should not be expensive for individuals facing financial difficulty. It should also support them to avoid detachment from society so as to prevent social isolation, loneliness, or states of poor mental health.

In designing this device, you are obligated to meet the following criteria:

- Avoid dependency on others (e.g., maneuverable across difficult, uneven, narrow, or inclined terrains)
- Low cost
- Easy to store or move device when not in use.
- Easy to maintain and repair
- Support basic daily living (e.g., movement from device to bed, toilet, chair, etc.)

You should aim to be as creative as possible. Please take the next five minutes to reflect on the brief.

Prevention design brief

Design Task Instructions

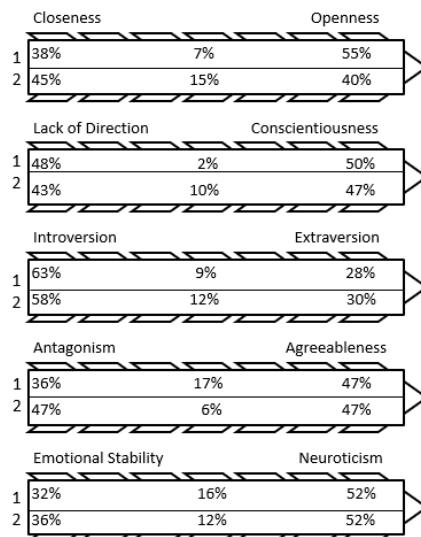
Design a device that can enhance physical mobility and enable independence amongst the elderly or people with physical disabilities. This device should be inclusive for individuals of all social classes, including the poor. It should also help them integrate into the broader society so that they can enhance their social and psychological well-being.

In designing this device, you can aspire to achieve the following criteria:

- Enhance individual mobility (e.g., maneuverable across difficult, uneven, narrow, or inclined terrains)
- Inclusive for all social classes, including the poor.
- Easy to store or move device when not in use.
- Easy to restore to working condition
- Empower independence (e.g., movement from device to bed, toilet, chair, etc.).

You should aim to be as creative as possible. Please take the next five minutes to reflect on this brief.

Promotion design brief



Student big five scores

